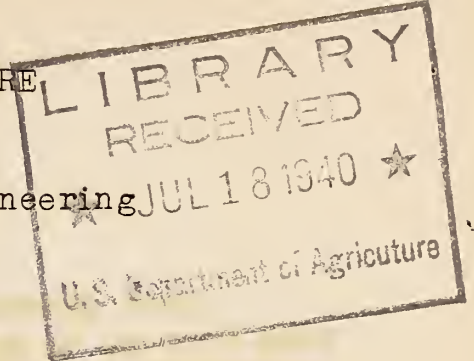


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UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Marketing Service
and
Bureau of Agricultural Chemistry and Engineering



COTTON-QUALITY IMPROVEMENT WITH PARTICULAR REFERENCE TO GINNING

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(Presented by the Senior Author before a meeting of the Alabama Cotton Ginners' Association, Birmingham, Ala., May 22, 1940.)

In the organized efforts now being made to improve the quality and spinning value of American cotton, the ginners of Alabama and other cotton-growing States are playing an important part and will, no doubt, continue to do so on even a larger scale. These efforts are put forth in order to bolster the competitive position of our cotton in domestic and foreign markets and in relation to newly discovered synthetic fibers. The ginners are assuming this responsibility not only to protect their own interests but to promote the well-being of their customers--the farmers, upon whose success the ginners' prosperity depends. Before going into a discussion of the ways and means by which ginners are attacking the problem involved in providing improved cotton quality, I should like to take a few minutes to talk to you about cotton quality--what it is, what we know about it, what elements have been recently isolated and found to be important, and what practical problems are involved.

Quality Elements Involved in Cotton Improvement

In the marketing of the American upland cotton crop, three quality elements are used to describe and appraise the lint. They embrace the physical properties that influence its spinning value. They are known commercially as grade, staple, and character. Practical standards for grade and staple are maintained by the U. S. Department of Agriculture ^{1/}, and efforts are being made to develop standards for character.

^{1/} The Classification of Cotton. U.S. Dept. Agr. Misc. Pub. 310, 1938.

Most ginnerers are familiar in a general way with grade, with the factors that go to make up grade (that is, color, leaf, and preparation), and with staple length. I shall, therefore, dwell only for a moment on a further breakdown of some of these things and then pass on to a discussion of some of the more intangible qualities which significantly affect cotton-spinning value and which are lumped together, for convenience, under the term of character.

The grade of cotton reflects to a considerable extent the waste that will be removed during the manufacturing processes, and it also may play an important part in determining the types of goods which may be manufactured from it. Naturally, if the cotton is leafy or of poor preparation, it will yield larger quantities of manufacturing waste in the spinning processes. Poor preparation is characterized by nappiness, ropiness, motiness, roughness, and neppiness. "Naps" are large tangles of fibers caused by ginning cotton with an excess of moisture or with dense seed rolls, and they, like the imperfections associated with rough and motey cotton, constitute a part of the waste discarded during spinning. "Neps" are very small tangles of fibers and they are nearly always associated with so-called immature or thin-walled fibers. Although neps are extremely small, frequently of almost microscopic dimensions, they can be detected rather easily and quickly in classers' staple pulls by the unaided eye.

No saw-ginning process has yet been discovered for the prevention of neps in cottons having fiber qualities that make them susceptible to napping. Many of the neps produced in ginning are carried through the manufacturing processes, along with others that are formed during the processing, to make the yarn neppy and undesirable from the standpoint of appearance, evenness, dyeing, and other properties. It is for these reasons, therefore, that neps are so detrimental and undesirable in cotton-quality production and that neppy cotton is so penalized in classification and marketing.

In this connection, I wish to emphasize that Sea Island cotton should not be ginned on saw gins. Why? Because the saw-ginning process so badly neps the cotton and so severely cuts or breaks the fibers. Our results show that, on the average, saw-ginning of Sea Island cotton reduces its staple length by $1/16$ to $3/32$ of an inch. On the other hand, proper roller-ginning of Sea Island cotton leaves the cotton comparatively free of neps and without damage to fiber length. Thus, if quality is to be preserved, Sea Island cotton should be most carefully handled on roller gins; also, it should be most carefully harvested and handled prior to ginning.

In passing now to the matter of cotton character, which may be defined as those elements of cotton quality not included in grade or staple length, it should be emphasized that, although many factors are recognized as being a part of character, it has been only in recent years that the relative importance of certain measurable ones has been precisely determined.

Fiber length and uniformity, fiber strength, fiber fineness, and wall thickness are susceptible to measurement--length uniformity by mechanical fiber-sorting devices and photo-electric means; strength, by the Chandler bundle method and others; fineness, by the weight per unit length method and the fiber cross-section technique; and wall thickness, by microscopic examination.

Yarn strength is influenced principally by staple length and such character properties as have been indicated. Generally speaking, the longer the fiber, the finer it is. Naturally, therefore, the longer and finer the fiber, the stronger the yarn that is spun from it, for the reasons that there are fewer "splices" in yarn made from long fibers than in that made from short fibers; and that there are more fibers to withstand breakage in a cross-section of yarn of a given size made from longer staple cotton than from short staples. To illustrate, a recent section of fine-fibered cotton from a widely grown variety has tested nearly 20 percent higher in yarn strength than has the general run of cotton of like staple length in tests made in the spinning laboratories of the Agricultural Marketing Service. The influence of uniformity of fiber length on yarn quality has also been definitely determined in these laboratories, along with that of fiber bundle strength, but time does not permit me to dwell longer on these phases.

The Ginner's Contributions in Cotton Improvement

In the light of the foregoing facts on cotton quality elements and problems, it is evident that ginner's can play a vital part in cotton-improvement programs. They can give the grower improved service not only by adequately equipping their gins, maintaining all parts of their outfits in good condition and using the machinery correctly, but by encouraging their farmer-customers to plant good cotton, use improved harvesting methods, and exercise more care in handling the cotton on the farm. Both ginner's and farmers can and should keep themselves informed in regard to performance of cotton varieties in State Experiment Station tests with respect to yield, turnout, and quality.

The ginner's in your State have done much to induce farmers to plant improved varieties of cotton, and they have assisted materially in the organization of one-variety cotton communities. These cotton-improvement groups are organized for the purpose, among other things, to produce a single variety of cotton, in order that the length, uniformity, and quality of the fibers may be improved; to obtain marketing advantages by producing regular quantities of uniform fiber; to maintain conditions necessary for the increase of stocks of superior planting seed; and to encourage better preparation of cotton for market by the adoption of better harvesting and handling practices and improved ginning methods.

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During 1939, there were 130 active one-variety communities in the State of Alabama composed of 8,412 members who produced 56,428 bales on 112,587 acres ^{2/}. In this connection, 137 ginners made the agreements in 1939 with 93 of the organized groups of cotton producers so the producers could obtain free classing service from the U. S. Department of Agriculture under the Smith-Doxey Act, on cotton produced by about six thousand members on nearly a hundred thousand acres of land. All these ginners agreed to use their gin machinery exclusively for the ginning of the cotton produced by the farmers' organization, or to set aside certain days for such ginning and to clean thoroughly all machinery before using it. This was done in an effort to maintain the purity of the seed. The ginners also agreed to repair, adjust, and otherwise put their gins into proper condition and to use every precaution necessary with respect to adjustments of gin machinery and in properly handling the cotton in the gins so that the quality of lint and seed of each and every bale would be preserved. In addition, many of the ginners assumed the responsibility as group leaders.

The group leader's responsibilities included explaining to members ways and means of using the classification and market news data for making the service a profitable venture. These had to do with keeping the farmers informed about cotton that is reduced in grade because of poor ginning resulting from careless harvesting and handling methods. Showing a comparison of prices paid for cotton harvested under different conditions is an example of how the importance of careful harvesting could be emphasized. The ginner-leaders handled the details incident to drawing, identifying, and shipping the samples. They also could assist in making the classification data useful in selling the cotton, and in encouraging local buyers to recognize it in arriving at prices.

In addition to the ginners cooperating in the cotton classing service previously mentioned, 60 Alabama ginners are cooperating with the U. S. Department of Agriculture by furnishing samples from all their ginnings for classification. Upon this information, the Department bases its estimate of grade and staple length of cotton produced in Alabama. These ginners make available to their patrons the classification data obtained under this cooperative arrangement.

Progress in Cotton Gin Modernization

Along with being helpful to producers in selecting improved varieties of cotton for production on an organized basis, in encouraging better harvesting and handling methods, and in aiding producers to determine the value of cotton, Alabama ginners have in recent years made good progress in their efforts to modernize their gins and thus to render a better service to their patrons. Not only has there been progress reported in repairing gins and bringing them up-to-date, but the movements to replace machine

^{2/} This information was supplied through the courtesy of C. A. McClendon, Agronomist, U. S. Bureau of Plant Industry.

units and install additional machinery basic to good ginning, together with an increased tendency to exercise more care in gin operation, have gained considerable impetus in recent years.

Surveys made of representative gins in Alabama in 1930 revealed that only about 5 percent of the gins studied were equipped with extractor feeders. By 1935, the percentage increased to 24, according to the Bureau of Census data. A recent estimate based on reports from manufacturers, ginners, and others concerned, indicates that about one-third of the Alabama gins are now equipped with extractor feeders. In 1935, the Census Bureau reported 14 cotton driers in Alabama; the number increased to 38 in 1938, and 28 were installed in 1939, bringing the total to 66 gins equipped with driers, or 5 percent of the State's gins as compared with 9 percent for the entire Cotton Belt, which had almost 1100 driers in use last year (fig. 1).

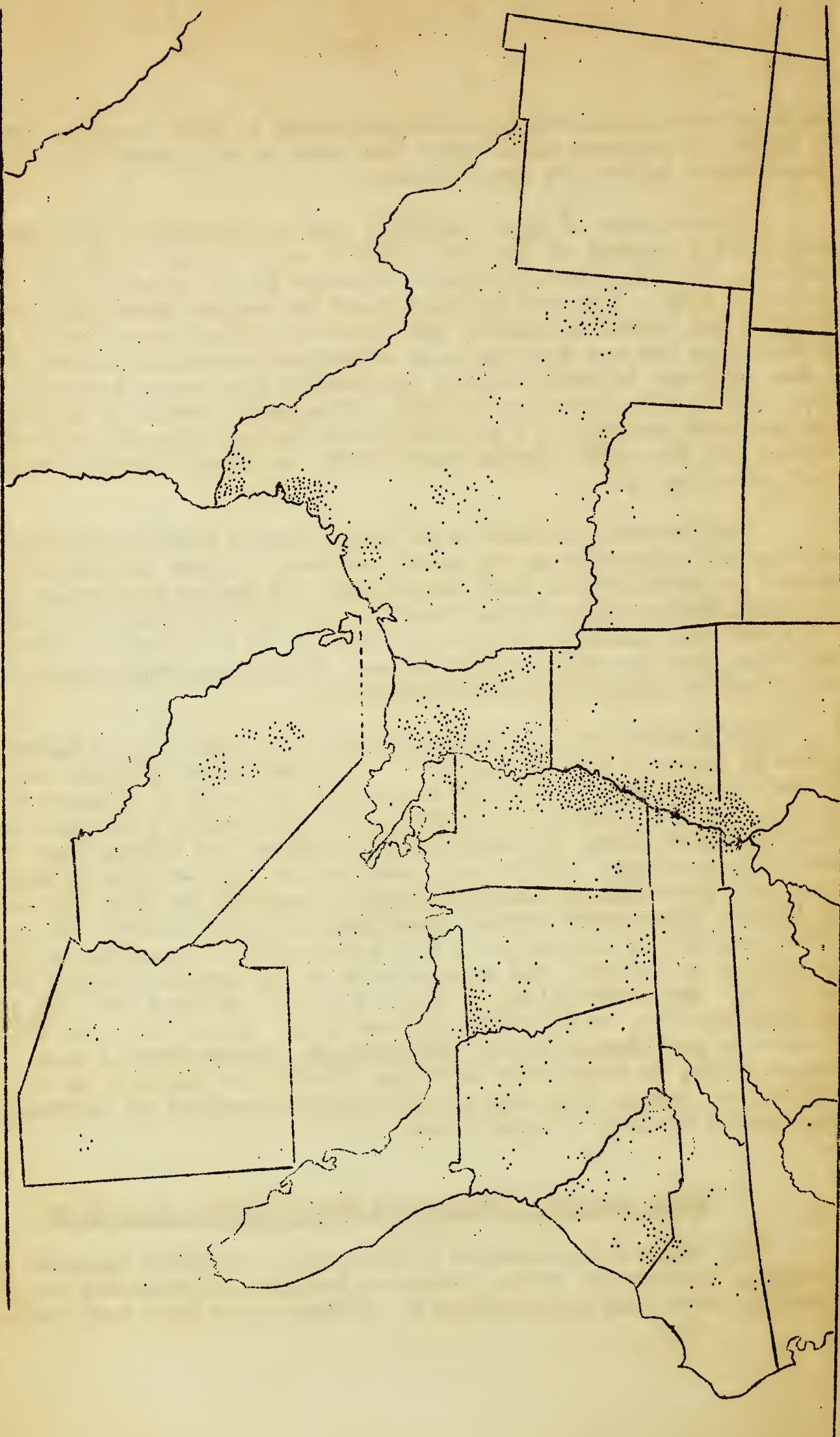
The increased production of longer staple cotton in one-variety communities and elsewhere in the State has been a factor responsible for the gradual increase in cleaning, extracting, and drying facilities in Alabama and other Southeastern States, because the longer cottons are harder to clean and more difficult to gin when brought to the gin in a green and damp condition than the shorter cottons; and, therefore, require more elaborate and effective equipment for processing it.

Although we have no first-hand data on trends in saw speeds over a period of years in Alabama, our data collected in the Mississippi Valley States are showing an increased tendency on the part of ginners to increase the speed of gin saws in an effort to gin with looser seed roll and provide smoother ginned lint. No doubt Alabama ginners are finding this to be a profitable practice. It not only provides for better quality lint, but reasonable increases in saw-speed make it possible to clean the seed better and improve gin turnout without impairing spinning quality. It is not uncommon to find any type of the later models of gins operated as high as 600 revolutions per minute, and many as high as 700 revolutions per minute in the Delta. About two-thirds of these gins are equipped with the improved straighter-backed, or the finer-toothed saws. These have been found to be superior in performance to the roached-back, coarse-toothed saws. Alabama ginners, also, no doubt, for their own benefit and for that of their patrons, are taking advantage of the benefits provided by improved saws and other modern features of gin stands.

Other Ginning Developments Being Adopted by Ginners

With increased production of and care in handling improved varieties of cotton, ginners are making provision for more conveniently and economically keeping seed pure during ginning. Various means have been devised.

FIGURE 1. - U. S. Cotton Ginning Laboratory, Stoneville, Miss..
LOCATION OF COTTON GINS EQUIPPED WITH COTTON DRIERS IN THE UNITED STATES, SEASON 1939-40



United States, 1071; Alabama, 66; Arizona, 9; Arkansas, 121; California, 48; Florida, 3; Georgia, 30;
Illinois, 2; Kentucky, 4; Louisiana, 166; Mississippi, 182; Missouri, 96;
New Mexico, 3; North Carolina, 21; Oklahoma, 10; South Carolina, 27;
Tennessee, 21; Texas, 231; and Virginia, 1.

The two more commonly employed systems are one, the blow-pipe vacuum system, under the gins, with connection to a fan handling clean air; and the other, the belt system under the gins for feeding pure seed to sacks in the gin house or to the blow system to the seed house. In 2-story gins, screw conveyors have been converted to acceptable seed-saving devices by hinging the bottom so that it can be dropped for thorough cleaning of the conveyor box, augur, hangers, etc.

In the ginners' efforts to reduce gin-operating costs so that improvements can more readily be made to give better service to producers, it is often necessary to make small savings in power and maintenance costs of numerous items in the gin--the sum total of which is frequently quite significant. Fan-power requirements of 63 gins studied in the Delta averaged 40 percent of the total gin-operating requirements. Ginners are effecting savings in fan power by lowering fan speeds, repairing fans, reducing separator air losses, correcting the size of cotton handling pipes, repairing leaky pipe connections, reducing the number of elbows in piping, substituting improved methods of handling seed for unloading fan exhaust blow method, adding control devices and gauges on fan inlets for regulating air requirements, and utilizing improved drives and bearings in operating fans.

One good example of power savings in these items is that which often can be made by doing away with or repairing leaky separators. In 14 Delta gins which had separator losses of 35 percent or more, the power required to operate the suction fan averaged 27.6 horsepower. In a similar group of 18 Delta gins having losses of less than 35 percent, the fan horsepower requirements averaged 19.2 horsepower, which is 8.4 horsepower, or 30 percent less than the average for those connected to leaky separators. Means for reducing the power requirements of other machine units of the gin include operating with loose seed rolls, avoiding the ginning of damp or wet cotton, feeding cleaners and extractors at uniform rates to prevent chokages and restriction of the cotton therein, delivering a uniform bat of lint cotton to the press, and avoiding big-ended or big-sided bales that require extra power and other losses in pressing.

Application of Gin Information to Practical Operations

Alabama ginners are manifesting interest in the gin extension program of their Extension Service. They receive through this source ginning bulletins and pamphlets that are periodically released by the Department; and the Agricultural Engineering Specialist at Auburn has reported to us concrete evidence of practical application by Alabama ginners of the results released in these publications.

In this connection, the Laboratory has prepared and released Leaflet 169, "Preventing Gin Damage to Cotton," which ginnerers are using as a guide to follow in tracing the cause of gin damage, and correcting faulty ginning. Briefly, this leaflet gives the steps to take in ascertaining whether the source of damage is in the cotton or the machinery. If it is found to be in the cotton, the problem is simple, generally requiring some method of drying, or better still, care in harvesting, to cope with it. If it is in the machinery or the method of operation, some very careful tests and observations are required.

Now, how do we go about finding the cause or causes of the trouble? Of course, the first thing to check in gin operation is the seed roll. If the rolls are too dense, the factor or factors responsible must be determined. This involves the checking of items in the order of importance somewhat as follows: Condition and setting of gin saws, ribs, brushes, and air-blast system; brush speed and air-blast pressure; speed of gin saws; settings of seed, mote, and dividing boards; speed of feeders; and condition and settings of cleaning and huller devices, lint flue and condenser. In any such investigation, a reliable classification of the cotton, with particular reference to sample preparation, is essential.

Your Agricultural Engineering Extension Specialist, Mr. J. B. Wilson, who is present at your meeting today, is desirous of helping you solve ginning problems of this kind. Avail yourselves of his services, or call on him for assistance. During the past year, he held some educational meetings for producers and ginnerers, and obtained good response. Mr. Wilson and the Agronomist on Alabama Cotton Improvement Work, Mr. J. T. Belue, were among the extension specialists from 11 States who attended the Cotton Ginning Extension Conference held last month at the U. S. Cotton Ginning Laboratory, Stoneville, Miss., where first-hand information was given them on cotton harvesting, handling, ginning, and packaging problems, tests and results.

In closing, I should like to leave one other thought with you. It is this: All of us at the Government Ginning Laboratory are always glad to have you come to Stoneville and to discuss your problems with us whenever you have an opportunity. We had a number of Alabama ginnerers and cotton producers visit our laboratory during last year, and we hope that even more of you will come in the future.